with anything less than twenty-six inches, and only with that under first-class conditions. I give here the observations that I have so far obtained, and defer any suggestions as to a name until a later paper. It certainly should not disturb the present harmony existing in the Roman numerals already applied to the satellites.

"It is so wholly different from any of the other moons in physical aspect, that it ought, in a sense, to be considered independent of them, and simply be called, say, the fifth satellite, with a suitable mythological name.

"It will be seen that on three of the dates of observation the east elongation is well covered in the measures."

Plotting the observations at elongation, the following values of the distance were obtained:—

			From Jupiter's centre. Miles.
September 10 (apparent)	61″·04	log R =	7·08267·112250
,, 12 ,,	61″·55	,,	7·08452·112750
,, 14 ,,	61″·60	,,	7·08324·112400

From these the following periods result, using the well-known formula:—

$$P = p\sqrt{\frac{m}{M}\frac{R^3}{r^3}}.$$

	h.	m.
September 10 period	11	47·6
,, 12 ,, ...	11	52·3
,, 14 ,, ...	11	49·0
Mean	11	49·63

The observations, all made in standard Pacific time (eight hours slow of Greenwich) are given at length in the *Journal*.

The latitude measures show that the satellite's orbit lies in the plane of Jupiter's equator, and Mr. Barnard holds that it is consequently a very old member of Jupiter's family, "since it would doubtless take ages for the orbit to be so adjusted." W. L.

NOTES.

THE ordinary general meeting of the Institution of Mechanical Engineers will be held on Wednesday evening, October 26, and Thursday evening, October 27, at 25, Great George Street, Westminster. The chair will be taken at half-past seven p.m. on each evening by the President, Dr. William Anderson, F.R.S. The ballot lists for the election of new members, associates, and graduates having been previously opened by the Council, the names of those elected will be announced to the meeting. The nomination of officers for election at the next annual general meeting will take place. The following papers will be read and discussed, as far as time permits:—Second Report of the Research Committee on the value of the steam-jacket, by Mr. Henry Davey, Chairman (Wednesday); and experiments on the arrangement of the surface of a screw-propeller, by Mr. William George Walker, of Bristol (Thursday).

WE are asked to intimate that the late Prof. Adams has left a number of separate copies of certain of his mathematical and astronomical papers, and that Mrs. Adams will be happy to distribute them to scientific friends who make application for them by letter addressed to her at 4, Brookside, Cambridge.

THE Harveian oration was delivered on Tuesday afternoon by Dr. J. H. Bridges. He presented an able and most interesting sketch of the scientific influences amid which Harvey's work was done, and the relation of his great discovery to later research.

THE controversy as to vivisection is still going on in the *Times*. For the present, therefore, it may be enough for us to reproduce the letter which was signed by Sir Andrew Clark, Sir James Paget, Dr. Samuel Wilks, and Sir George Humphry, and printed in the *Times* on Saturday last. It is as follows:—"Having already expressed our views, personally or by letter, to the Church Congress, we decline to enter into any further public discussion on the question of so-called 'vivisection,' for the following reasons, the statement of which we make solely because we think it is due to your readers:—Firstly, after full consideration, we are satisfied that the scientific aspect of this question cannot receive adequate and just treatment in the columns of a newspaper. Secondly, because it is hardly possible for us to name any progress of importance in medicine, surgery, or midwifery which has not been due to, or promoted by, this method of inquiry."

PROF. VIRCHOW was invested, on Saturday last, with the insignia of office as Rector of the University of Berlin. He chose "Learning and Research" as the subject of his address. He acknowledged that study had contributed greatly to create a mutual basis of understanding and a common educational foundation for the peoples of Europe, strengthening at the same time the idea of consanguinity. That state of things, however, was, he thought, entirely changed, and he contended that the turning-point in the supremacy of the classical languages had been reached. "A grammatical education is not the means for progressive development demanded by our youth. Mathematics, philosophy, and the natural sciences give young minds so firm an intellectual preparation that they can easily make themselves at home in any department of learning."

PROF. BERG has succeeded the late Dr. Burmeister as director of the National Museum in Buenos Ayres.

DR. G. V. LAGERHEIM, at present director of the Botanic Garden at Quito, Ecuador, has been appointed curator of the museum at Trömso, Norway.

MR. W. G. RIDEWOOD, B.Sc., of the Royal College of Science, South Kensington, Assistant to the Director of the Natural History Museum, has been appointed Lecturer in Biology to the St. Mary's Hospital Medical School.

THE October number of the *Kew Bulletin* opens with a section giving some interesting information as to Lao tea. Some time ago a singular method of using the leaves of what has since been proved to be the Assam tea plant of commerce (*Camellia theifera*) was brought before the Society of Arts by Mr. Ernest Mason Satow. Amongst the Laos, a people inhabiting a district of Siam, in the neighbourhood of Chiengimai, the tea leaves are not used for making an infusion as in other countries, but are prepared wholly for the purpose of chewing. The leaves are first steamed and then tied up in bundles and buried in the ground for a period of about fifteen days. Leaves thus prepared, called locally "mieng," are said to keep for two years or more. The habit of chewing "mieng" is almost universal among the Laos, and to men engaged in hard work, such as poling or rowing, it is said to be almost indispensable. The *Bulletin* prints a correspondence in which the result of an inquiry made by Kew in regard to the plant yielding "mieng" and the method of preparation is detailed.

THE other sections in the October number of the *Kew Bulletin* deal with Chinese silkworm gut; mangrove bark and extract; Burmese black rice; Mauritius tea; potato disease in Poona; British North Borneo; and Allouya tubers. There are also some miscellaneous notes.

WE learn from the *Journal of Botany* that Dr. H. Trimen, F.R.S., the Director of the Botanic Gardens at Paradeniya Ceylon, has received the sanction of the Government to proceed with the publication of the flora of that island. The work will be published in parts by Messrs. Dulau and Co., and will form two vols. octavo, together with a quarto atlas of 100 coloured plates,

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drawn by the native Cingalese artists attached to the gardens. The first part is now in the press. The book is more especially designed for use in the colony, and will enter into more local detail than has been hitherto the practice in the Colonial floras published by the Government.

MR. G. HOGBEN delivered an excellent address lately before the Canterbury College Science Society, New Zealand, on earthquakes. In the course of his remarks he described the system which, for the last three years, has been in force in New Zealand for the observation of earthquake phenomena and the telegraphing of the results to a central station. This system has been adopted in Victoria, New South Wales, South Australia, and Tasmania, and will probably be shortly adopted in Queensland. The various colonies exchange reports with New Zealand, and it is proposed that the system shall be further extended, so that the colonies may be brought into communication with the islands of the Pacific and America and Japan.

A REUTER telegram despatched from Vienna on October 14 announced that reports had reached that city of the occurrence of violent earthquake shocks in Eastern Europe. The vibrations were strongest in Roumania, being felt at Bucharest, where they lasted 15 seconds, and at Galatz during 30 seconds. At Oltenizza the shock lasted fully 90 seconds, and did considerable damage in the town. A shock was felt at Sofia on October 14, at seven o'clock A.M., and also at Philippopolis, Varna, and Rustchuk. The seismic wave passed from south to north, the vibration lasting several seconds, and being accompanied by subterranean rumbling.

THE depression over the Bay of Biscay referred to in our last issue took a very unusual route, the track being almost circular, moving first in an easterly and north-easterly direction towards the north of France, and then recurving by the south-west of England back to the Bay of Biscay, when it again travelled to the eastward. The disturbance caused to the weather in this country was very great and the rains were very heavy, with serious floods, especially in Wales and the midland and northern counties. In Yorkshire it rained almost incessantly from Thursday to Saturday, a fall of $1\frac{3}{4}$ inch being measured in one day. The weather was still further disturbed by an area of low pressure lying over the north of Germany between Sunday and Monday, which caused disastrous gales and further heavy rains in the eastern part of the country. The temperature has been very low for the season, the daily maxima scarcely reaching 55° in any part of the kingdom, owing to the persistent northerly and north-easterly winds. Towards the close of the period temperature fell several degrees lower, with sharp day frosts in Ireland, under the influence of an anti-cyclone, which spread over the country from the Atlantic, while hail and sleet showers fell in places. The *Weekly Weather Report* of the 15th inst. showed that the temperature of the past week was everywhere below the mean, being as much as 4° in the south-west of England and 5° in the south of Ireland. The rainfall greatly exceeded the average over the north and east of England.

AN anemometer by M. Timchenco of a novel construction is described by Prof. Klossovsky, of the Odessa Observatory, by which both the wind direction and velocity are marked on a cylinder by one symbol. The recording apparatus is moved by clockwork and the indications are made by electrical contacts. The duration of the contact depends upon the velocity of the wind, a light wind producing a contact of longer duration than a strong one. The indications are by means of arrows printed on the paper covering the cylinder, which show the direction of the wind, and the number of arrows marked on a length of paper corresponding to one hour furnishes data for finding the velocity by an empirical scale determined by comparison with a Robinson's anemometer. The apparatus only requires to be adjusted twice a month, or in some instruments only once a month, and calls for no attention in the meantime. A battery cell is sufficient to produce the contact, for most of the work is done by means of weights.

THE *Annuaire* of the Municipal Observatory of Montsouris for the years 1892-93 contains, in addition to the usual tables showing *inter alia* the extremes of temperature at Paris since 1699 and the monthly rainfall values since 1690, much useful information with reference to the climate and the microscopic examination of the quality of the air. Although it does not fall within the province of the observatory to issue weather forecasts, applications for such information are sometimes received and answered, in the interest of agriculture. The opinion is expressed that by basing the calculations on the general methods adopted by Laplace in his memoir entitled "Probabilité des causes d'après les événements," it is not impossible to give a long forecast which may be at times of much use. Some interesting remarks are also made as to the possibility of foreseeing the character of the summer from the weather experienced in the early spring, based chiefly on the time of the appearance of the north-east winds, and the differences in their usual strength and physical qualities, in connection with the transparency of the air. The results of the analysis of the air show that the minimum amount of carbonic acid occurs between May and September, and that the amount at night is greater than during the day.

THE new University of Chicago has decided that its work shall go on all the year through, including the summer months. According to the New York *Nation*, the calendar year is divided into four quarters of twelve weeks each, beginning respectively on the first days of October, January, April, and July; and at the end of each quarter there is to be a recess of one week. Each quarter consists of two terms of six weeks. No student is to be held to an attendance of more than three quarters, or six terms, in each year, so that the normal academic year is no longer than at other colleges. Each student is to begin his academic year whenever he is ready, and to take his quarter's vacation whenever it suits his convenience. He may even take his two terms of vacation in different quarters.

AN investigation of the phenomena exhibited at the negative poles of vacuum tubes appears in vol. xl. of the *Sitzungsberichte* of the Prussian Academy. Professor E. Goldstein considers that the term "stratification" as applied to the light at the cathode is a misnomer, since two at least of the strata can be shown to pervade the entire region of luminosity. The light nearest the cathode is yellowish, and about 1 cm. thick. Next comes Crookes' "dark space," which in reality shines with a faint blue light. Then follows the third and most highly luminous layer, whose colour changes from a blue to a violet as the exhaustion is carried further. The first layer was shown to be a separate phenomenon on a previous occasion. The so-called second layer shows the peculiarity of rectilinear propagation. It is emitted from the electrode normally to its surface, or very slightly divergent, whereas that of the third layer spreads throughout the bulb and even passes round corners. The second layer is best shown by concave poles, which concentrate the light at the centre of curvature. If observed through a blue glass, which cuts off the third layer, it is seen to diverge from the focus and impinge upon the wall of the bulb. The phosphorescence observed in the glass where it is struck by the "radiant matter" is due to this part of the light only, and not to the third layer. It is this also which produces the well-known phenomena of shadows. A glass rod laid in its path casts a shadow through the blue space, which is, however, relieved by the purple luminosity of the third layer. The former is also the only light deflected by a second cathode. It is to be concluded that the light at the negative pole of a vacuum tube consists of three different species, each pervading the others, but having distinct and characteristic properties of its own.

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IN the current number of the "Annals of Scottish Natural History," Mr. E. P. Knubley discusses the question whether legislative protection is required for wild birds' eggs. He suggests that the most practicable plan might be for Parliament to grant powers to the County Councils from time to time, and as necessity arose, to place certain portions of a district, such as mountains, commons, waste places, lakes and meres, or portions of cliffs or foreshores, under an Act for specified months in the year—say, from April 1 to June 30. What, however, is most urgently wanted, as Mr. Knubley says, is that landlords and occupiers shall, as far as possible, protect birds breeding on their property or "occupation."

MR. ERNEST ANDERSON recently read before the Field Naturalists' Club of Victoria an interesting paper on some Victorian Lepidoptera. He said that a great charm accompanied the rearing out of the Victorian species, because the results were very frequently of a most unlooked-for character. The Victorian forms followed the same rule as many plants and animals in having characteristics and habits purely Australian; and not only so, but they helped to bridge over the sharply-defined divisions known in Europe, and merged the various groups so imperceptibly into each other that it was hard to say where one ended and another began. Speaking of the processional caterpillars (*Teara melanosticta*), Mr. Anderson described how a female laid some ova in a small box and covered them very thickly with yellow down. Very shortly afterwards a thread-like structure was visible, which close examination revealed to be composed of newly-hatched caterpillars in Indian file, each having its head close up to the tail of its forerunner, and the whole line moving simultaneously with mathematical precision.

THE use of gas engines does not seem to be nearly so common in the United States as in Great Britain. According to the *Railroad and Engineering Journal*, they are generally regarded in America as of service for light work only, and it is with some surprise that our contemporary has noted the advertisement of an English firm, which keeps all sizes up to forty-horse-power in stock, and offers to furnish single engines of any size up to two-hundred-and-fifty-horse-power. This much exceeds the capacity of any gas engine built until very recently.

THE U.S. Department of Agriculture has published a valuable account, by Harvey W. Wiley, of experiments with sugar-beets in 1891. The experiments were divided into three classes; (1) culture of the sugar-beet conducted by farmers in different parts of the country; (2) culture of the sugar-beet conducted by the agricultural experiment station of Wisconsin and numerous farmers in Wisconsin, under the direction of the agricultural experiment station of that State, by authority of the Secretary of Agriculture; (3) experiments conducted at the beet-sugar experiment station of the Department at Schuyler, Nebraska.

WE learn from the *American Naturalist* for October that the vertebrate fossils collected by Prof. Marsh, to which we lately referred, are not likely, after all, to be soon exhibited in the National Museum at Washington. Our contemporary says: "One side of a small room is the only space at present occupied by the material in question, and it is safe to say that no other space has been yet provided. As the National Museum committed the error at its establishment of attempting an exhibit of modern human industries, as we pointed out at the time, the space for scientific exhibits is necessarily greatly curtailed. The necessities of this department require the erection of a new building, and until that is done it is safe to say that the vertebrate collections of the U.S. Geological Survey will not be exhibited."

SLEEP is one of the least understood of physiological phenomena. A new theory of it (we learn from the *Revue Scientifique*) has been offered by Herr Rosenbaum. He supposes the essential fact in the fatigue of the nervous system leading to sleep to be a hydratation of the nerve-cells, an increase of their water-content. The greater the hydratation, the less the irritability. This hydratation arises through chemical change of the nervous substance during activity. A small part of the water escapes by day through the lungs, but the greater part is eliminated during sleep. Its passage into the blood takes place by virtue of the laws of diffusion, and depends on the quantity and density of the blood, its amount of fixed principles, its speed of flow, &c. Elimination of the expired air takes place according to the laws of diffusion of gases. The assimilable substances of the body take the place of the water eliminated in sleep. The repair of the physical and mental forces through sleep is due to this elimination and replacement. Intelligence is in inverse ratio of the proportion of water in the brain, and may be measured by this proportion, at least in the child. It may be doubted whether this theory explains the sleep of hibernating animals, or that caused by opium and anæsthetics.

D. J. MADISON TAYLOR has been elaborately investigating the various problems relating to physical exercise in health and as a remedy, and some of the results are set forth in the *Journal of the Franklin Institute* for September and October. One conclusion is, he says, uniformly prominent in the instances of damage from boat and other racing. Always the training has been "either insufficient or bad, or both."

IN one of the papers contributed to the third number of the Trinidad Field Club's Journal, Mr. J. Edward Tanner describes some interesting observations of the habits of the Parasol or Leaf Cutting Ants. Two nests of these ants were on his table at the time when his paper was being prepared. He begins by noting that all in Trinidad who are interested in such subjects know the hurried manner in which a parasol ant returns to her nest (all leaf-cutting workers are females), bearing erect in her mandibles the portion of leaf she has herself just cut off, and apparently running home with it in triumph. These foragers, for they are the ones who supply the household, carry their portion of a leaf well into the nest, drop it, and return for another piece, nor do they cease doing so till the supply is more than those in the nest require. Mr. Tanner could not induce the ants in one of his nests to carry any leaf whatsoever into the nest, till one day he coaxed a small worker to do so. As she entered she was caressed by those in the nest, who stroked and patted her with their antennæ. The small piece of leaf she had brought was at once taken by one of the larger workers, to go through its various processes, while she returned for more, and she continued to bring in pieces till late in the evening. Strange to say, none of the others followed her example. Even four weeks later only two or three carried in any portions of leaf. Mr. Tanner suggests that this may have been due to the fact that the queen was accidentally killed while the nest was being taken. The other nest had a queen, and with it there was no trouble, for the ants kept themselves well supplied from whatever was offered to them on their feeding ground, whether rose leaves, plumbago, or quis-qualis. "Each forager," says Mr. Tanner, "drops her portion of leaf in the nest, which is taken up as required by the small workers, and carried to a clear space in the nest to be cleaned. This is done with their mandibles, and if considered too large it is cut into smaller pieces. It is then taken in hand by the larger workers, who lick it with their tongues. Then comes the most important part, which almost always is done by the larger workers, who manipulate it between their mandibles, mostly standing on three legs. The portion of leaf is turned round and round between the mandibles, the ant using her palpi, tongue, her three legs, and her antennæ while doing so. It

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now becomes a small, almost black ball, varying in size from a mustard seed to the finest dust shot, according to the size of the piece of leaf that had been manipulated. The size of the piece of leaf is from an $\frac{1}{8}$ by $\frac{1}{8}$ of an inch, by $\frac{1}{4}$ by $\frac{1}{4}$ of an inch. I do not wish it to be understood that only one class of workers manipulate the leaf, for all seem to take to it very kindly on emergency. Even the smallest workers will bring their tiny ball to where the fungus bed is being prepared. These balls, really pulp, are built on to an edge of the fungus bed by the larger workers, and are slightly smoothed down as the work proceeds. The new surface is then planted by the smaller workers, by slips of the fungus brought from the older parts of the nest. Each plant is planted separately and they know exactly how far apart the plants should be. It sometimes looks as if the plants had been put in too scantily in places, yet in about forty hours, if the humidity has been properly regulated, it is all evenly covered with a mantle, as if of very fine snow. It is this fungus they eat, and with small portions of it the workers feed the larvæ."

MR. O. P. HAY records in the latest volume of the Proceedings of the U.S. National Museum a curious habit of horned toads. Some years ago two boys from Texas, whose family had moved into his neighbourhood, showed him a few lizards belonging to the genus Phrynosoma, and popularly called horned toads. The boys declared that these little animals, when teased, would sometimes squirt blood out of their eyes. Mr. Hay did not think much about the matter at the time, but was lately vividly reminded of it in the department of reptiles in the National Museum. Near his desk there was a specimen of *Phrynosoma coronatum*, which had been sent from California by a member of Dr. Merriam's exploring party. About August 1 it was shedding its outer skin, and the process appeared to be a difficult one, since the skin was dried and adhered closely. One day it occurred to Mr. Hay that it might facilitate matters if he gave the animal a wetting; so, taking it up, he carried it to a wash-basin of water near by and suddenly tossed the lizard into the water. "The first surprise," says Mr. Hay, "was probably experienced by the Phrynosoma, but the next surprise was my own, for on one side of the basin there suddenly appeared a number of spots of red fluid, which resembled blood." He immediately recalled what the boys had told him of the ability of horned toads to squirt blood, and he concluded that this was a good time to settle the question whether this fluid was blood or not. A microscope was soon procured and an examination was made, which immediately showed that the matter ejected was really blood. A day or two afterwards Mr. Hay was holding the lizard between his thumb and middle finger, and stroking its horns with his forefinger. All at once a quantity of blood was thrown out against his fingers, and a portion of it ran down on the animal's n[illegible] and this blood came directly out of the right eye. Mr. Hay has since found that the phenomenon has been noticed by other observers, and, while he was preparing his paper, his attention was called to the fact that more than twenty years ago Mr. A. R. Wallace read before the Zoological Society of London letters from a correspondent in California, who described this creature as squirting from one of its eyes "a jet of bright red liquid very much like blood."

MESSRS. PERCIVAL AND CO. announce the following works:—"Geometrical Drawing," by A. J. Pressland; "Lessons on Air," by A. E. Hawkins; "The School Euclid," an edition of Euclid, Books i.–vi., with Notes and Exercises, by Daniel Brent; and a series of elementary text-books entitled "The Beginner's Text-books of Science," of which Mr. G. Stallard is the general editor.

MESSRS. GEORGE BELL AND SONS have published a second edition of Mr. A. J. Jukes-Browne's "Student's Handbook of Physical Geology." The author explains that in preparing this edition he has spared no pains to make it a trustworthy handbook for those branches of the science to which it relates.

MESSRS. WHITTAKER AND CO. have issued for the benefit of amateur coil-makers a practical manual on "Induction Coils," by G. E. Bonney. The author's object has been to place in the hands of his readers "a cheap and handy volume giving a general insight into the construction of ordinary spark coils, medical coils, and batteries for working them." There are more than a hundred illustrations.

MESSRS. LONGMANS, GREEN, AND CO. have issued a new edition, revised and largely re-written, of the well-known "Outlines of Psychology," by Prof. James Sully.

MESSRS. CHAPMAN AND HALL will shortly publish a work by Rev. H. N. Hutchinson, entitled "Extinct Monsters." It will be illustrated by Mr. J. Smit, who has made twenty-four restorations of antediluvian animals. The book is not intended for geologists only, but for all who are interested in the study of animal life. Dr. Henry Woodward, F.R.S., keeper of geology, Na tural History Museum, contributes a preface.

THE new number of *Records of the Australian Museum* (Vol. III., No. 2) opens with a paper, by Mr. J. Douglas Ogilby, on some undes cribed reptiles and fishes from Australia. To the same number Mr. C. Hedley contributes a paper on the structure and affinities of *Panda Atomata*, Gray. Mr. A. North has a note on *Manucodia comrii*, Sclater.

THE University College of North Wales has published its calendar for the year 1892-93.

GLYCOL aldehyde, $CH_2OH.CHO$, the hitherto almost unknown first aldehyde derived from glycol, forms the subject of a communication to the current number of the *Berichte* by Prof. Emil Fischer and Dr. Landsteiner. This substance acquires additional interest when the ordinary sugars are defined as aldehyde- or ketone-alcohols, for it then becomes the first member of the series. Prof. Fischer now shows how glycol aldehyde may readily be obtained, discusses its properties, and points out that by its polymerisation a new sugar is obtained, tetrose, the first synthetical sugar containing four atoms of carbon. The only evidence hitherto published of the existence of glycol aldehyde is that afforded by the work of Abeljanz and Pinner. The former chemist considered that he had obtained it by heating di-chlor-ether with water, and by the action of sulphuric acid upon mono-chlor-hydroxy-ether. But upon repeating the work of Abeljanz, Prof. Fischer finds that the substance considered, upon very slight evidence, to be glycol aldehyde is another compound altogether. Pinner afterwards attempted to obtain it by decomposition of a substance discovered by him, glycol acetal, with acids, but Prof. Fischer finds that this reaction only occurs under conditions such that the glycol aldehyde is itself also decomposed. In view of the formation of glyceryl aldehyde by the action of baryta upon acroleïn dibromide, a reaction now of historical importance as being the one which led Prof. Fischer to the first synthesis of grape sugar, it was thought probable that glycol aldehyde might be similarly obtained by the action of baryta upon the mono-bromine derivative of aldehyde, $CH_2Br.CHO$. Mono-brom-aldehyde, however, had never been hitherto obtained, so Prof. Fischer and Dr. Landsteiner first sought a method for its preparation. They eventually obtained it, as a viscid colourless liquid of powerful tear-exciting odour, by heating mono-brom-acetal, $CH_2Br.CH\langle^{OC_2H_5}_{OC_2H_5}$, with anhydrous oxalic acid. When the mono-brom-aldehyde thus

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obtained was mixed with water containing barium hydrate partly in solution and partly in suspension, and the whole maintained for half an hour at 0°, the odour of the brom-aldehyde disappeared almost completely. Upon removal of the baryta by sulphuric acid and the hydrobromic and sulphuric acids by lead carbonate, the filtered liquid was found to contain glycol aldehyde, which could be concentrated by evaporation over oil of vitriol *in vacuo*. The solution of glycol aldehyde reduces Fehling's solution with great energy at the ordinary temperature. When warmed with a solution of phenylhydrazine in acetic acid crystals of an osazone are deposited, just as happens in the case of other members of the series of sugars. Glycol aldehyde is readily oxidized by bromine water to glycollic acid, $CH_2OH.COOH$. When treated with a dilute solution of sodium hydrate polymerization occurs, a sugar of the composition $C_4H_8O_4$, the first synthetical tetrose, being formed, which is readily isolated in the form of its osazone (phenyl. hydrazine compound). This osazone appears to be identical with one obtained by Prof. Fischer from one of the oxidation products of natural erythrite. The preparation of glycol aldehyde completes the synthesis of the whole of the members of the series of sugars, from the first member up to the sugars containing nine atoms of carbon, with the exception of pentose. This latter sugar Prof. Fischer hopes shortly to obtain from the tetrose above described.

THE additions to the Zoological Society's Gardens during the past week include a Grivet Monkey (*Cercopithecus griseo-viridis* ♀) from Zanzibar, a Bengal Fox (*Canis bengalensis*) from Pondicherry, presented by the Rev. J. W. Scarlett; a —— Monkey (*Cercopithecus sp. inc.*) from the Zambesi, presented by Mr. Joseph A. Moloney; a Bonnet Monkey (*Macacus sinicus*) from India, a White Stork (*Ciconia alba*), European, presented by the Rev. Sidney Vatcher; a Mona Monkey (*Cercopithecus mona*) from West Africa, presented by Miss Synge; a Hairy Armadillo (*Dasypus villosus*) from South America, presented by Mr. J. H. Hamilton Benn; a Common Badger (*Meles taxus*), British, presented by Mr. W. Butler; a —— Galago (*Galago sp. inc.*) from East Africa, presented by Mr. Thomas E. C. Remington,; an —— Ichneumon (——), a Purple-crested Touracou (*Corythaix porphyreolophus*), two Black Gallinules (*Limnocorax niger*), a Tambourine Pigeon (*Tympanistria bicolor*), an Emerald Dove (*Chalcopelia afer*), four Half-collared Doves (*Turtur semitorquatus*), a —— Fruit Pigeon (*Treron sp. inc.*), four —— Tree Frogs (*Hylambates maculatus*), seven Smooth-clawed Frogs (*Xenopus lævis*) from East Africa, presented by General Mathews; three Mitred Guinea Fowls (*Numida mitrata*), a —— Snake (*Philothamnus semivariegatus*) from East Africa, presented by Mr. W. Hall Buxton MacDonald, M.D.; a —— Pratincole (*Glareola sp. inc.*), a Half-collared Dove (*Turtur semitorquatus*), a Nilotic Crocodile (*Crocodilus niloticus*) from East Africa, presented by Mr. R. MacAllister; two —— Francolins (*Francolinus* ——), a —— Coucal (*Centropus* ——), five Half-collared Doves (*Turtur semitorquatus*) from East Africa, a Black-tailed Hawfinch *Coccothraustes melanurus*) from Japan, presented by Mr. F. Pordage; a Flap-necked Chameleon (*Chamæleon dilepis*), two Square-marked Toads (*Bufo regularis*) from East Africa, presented by Mr. E. Millar; a Galeated Pentonyx (*Pelomedusa galeata*), two —— Skinks (*Gerrhosaurus major*), five —— Geckos (*Hemidactylus mabouia*), three —— Lizards (*Mabuia striata*) from East Africa, presented by Mr. Frank Finn, F.Z.S.; a Common Quail (*Coturnix communis*), captured at sea, presented by Mr. A. Torrie; a Honey Buzzard (*Buteo apivorus*) from France, presented by M. S. A. Pichot C.M.Z.S.; a Burrowing Owl (*Speotyto cunicularia*) from South America, presented by Mr. R. B. Shipway; two Common Boas (*Boa constrictor*) from Trinidad, presented by Messrs. Mole and Urich; a Black-headed Lemur (*Lemur brunneus*) from Madagascar, a Yellow-tailed Rat Snake (*Spilotes corais*) from Trinidad, deposited; an African Wild Ass (*Equus tæniopus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

A NEW COMET.—A telegram from Kiel announces the discovery of a new comet by Prof. Barnard on October 12 last, at 17h. 12·2m. mean Lick time. The position, as therein stated, was R.A. 293° 29′, and Declination + 12° 33′. As this new comet is termed "very dim," as seen with the large Lick refractor, it is needless to say that few instruments can at present observe it.

OUR SUN'S HISTORY.—The question of "How our Sun commenced to grow hot," is the subject of an article by Lord Kelvin in the October number of *L'Astronomie*. In these few pages he deals with various questions, among which may be mentioned: What is the temperature of the Sun? Is it increasing or diminishing? What was the state of the matter constituting our Sun before it was united into a single mass and began to grow hot? The answer to the last question leads him into the method of construction of our solar system. In considering the question of the encounter between two bodies as the origin, he finds that the probability of such an encounter between two neighbouring stars belonging to a large number of bodies, attracting one another mutually, and scattered in space, is much greater if they are at rest than if they are moving, even if their velocities are greater than those acquired in falling from rest. As an explanation of this Lord Kelvin takes the case of two solid and cold bodies of diameters equal to half that of the sun, and of mean densities equal to that of the earth, and supposes them at rest, the mean distance between each other being that of the earth from the sun. The collision caused by mutual attraction will transform the bodies into a fluid, incandescent mass, and he describes how this mass will arrange itself round this surface of collision. The next case he takes is similar to the one above, only the bodies have originally considerable velocities. Further on, as a special instance, he assumes the presence of 29 millions of solid cold globes, each having a mass equal to that of our moon, and the total masses of which are equivalent to that of our sun. These bodies, absolutely at rest, are supposed to be disseminated uniformly on the surface of a sphere (radius = terrestrial orbit), and allowed to fall towards the centre of the sphere by attraction. The result, to state briefly, is a mass of highly heated vapour, which afterwards expands and contracts consecutively, forming a gaseous nebula, measuring forty times the radius of the terrestrial orbit. By supposing that, instead of absolute rest at the commencement, these moons have a certain movement, the total sum of which represents a moment of rotation round a certain axis, equal to the moment of rotation of the solar system, this nebula would be a more or less facsimile of our solar system in its earlier stage, as figured out by La Place for his nebular theory. Thus this theory, "founded by La Place on the history of the sidereal universe such as Herschel observed, and completed in its details by his profound dynamical judgment and imaginative genius, appears to-day a truth demonstrated by thermodynamics." For the theory of the sun, Lord Kelvin says in conclusion that the antecedents immediately before incandescence cannot be definitely stated, since the latter may have been caused by large and few bodies, or by agglomerations of such bodies as meteorites.

SILVERING GLASS MIRRORS.—Mr. Common, in the *Observatory* for October, gives a brief account of various processes and methods for producing good reflecting surfaces. In the short historical sketch we find that the modern process is due to an observation of Baron Liebig, who, in 1835, found that on heating aldehyde with an ammoniacal solution of silver in a glass vessel a brilliant deposit of metallic silver was deposited on the surface of the glass. In all the methods used up till quite recently the surface to be silvered had to be suspended over the bath, owing to the formation of mud which settles down and prevents the proper deposition of silver; thus really large surfaces could not be dealt with. This was the case with Mr. Common's 3-foot, a pneumatic arrangement being made to hold the mirror by the back. In dealing with the 5-foot, this method could not be so easily applied, and experiments were made to find some means by which this "mud" could be entirely eliminated. This was successfully

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